

ACCESSION #: 9907300191

NON-PUBLIC?: N

LICENSEE EVENT REPORT (LER)

FACILITY NAME: Brunswick Steam Electric Plant (BSEP), PAGE: 1 OF 5

Unit No. 2

DOCKET NUMBER: 05000324

TITLE: Automatic Reactor Shutdown Due To Condenser Low Vacuum

Main Turbine Trip

EVENT DATE: 06/28/1999 LER #: 1999-006-00 REPORT DATE: 07/28/1999

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:

50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:

NAME: Steven F. Tabor, Project Analyst - TELEPHONE: (910) 457-2178

Regulatory Affairs

COMPONENT FAILURE DESCRIPTION:

CAUSE: SYSTEM: COMPONENT: MANUFACTURER:

REPORTABLE EPIX:

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On June 28, 1999, with Unit 2 operating at rated power, an automatic main turbine trip occurred due to low condenser vacuum. Consequently, as designed, the turbine trip resulted in actuation of the Reactor Protection system (RPS) trip logic and subsequent

reactor shutdown. Reactor vessel water level decreased below the low level 1 setpoint (i.e., 166 inches of water) resulting in Primary Containment Isolation system Group 2 (i.e., drywell floor and equipment drains), Group 6 (i.e., containment atmospheric control valves), and Group 8 (i.e., Residual Heat Removal system shutdown cooling valve) isolation signal actuations. The affected systems functioned as expected. The low condenser vacuum condition occurred due to successive trips of the circulating water intake pumps (CWIP's). Silt accumulation clogged the circulation water intake pump traveling screens, causing a high differential pressure condition across the screens, and subsequent pump trips. Corrective actions include review of operational guidance and development of an operational strategy to mitigate CWIP trips, evaluation of intake canal dredging and depth profile to determine adequacy, and review of the period of vulnerability for CWIP trips.

This event is being reported in accordance with the requirements of 10 CFR 50.73(a)(2)(iv) in that the condition resulted in the automatic actuation of Engineered Safety Feature systems including the RPS.

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Energy Industry Identification System (EIIS) codes are identified in the text as [XX].

#### INITIAL CONDITIONS

On June 28, 1999, Unit 2 was operating at rated power. Emergency Core Cooling systems (ECCSs) were operable. Prior to the event, the 2B, 2C, and 2D circulating water intake pumps (CWIPs)/[BS/P] were operating. Fine mesh screens were installed on the traveling screens [BS/P/SCN] associated with each of the operating Unit 2 CWIPs. The 2A CWIP was operable and in the standby condition with coarse mesh screens installed.

Unit 1 was operating at rated power. Prior to the event, the 1A, 1B, and 1D CWIPs were operating on Unit 1. Fine mesh screens were installed on the 1B and 1D CWIPs. Coarse mesh screens were installed on the 1A CWIP and the 1C CWIP was under clearance to support maintenance activities.

#### EVENT NARRATIVE

On June 28, 1999, at approximately 1800 hours, the Unit 1 CWIPs 1B and 1D traveling screen high differential pressure alarms were received in the control room. At 1805 hours, Operators that were dispatched to evaluate the cause of the alarms reported observing small fish on the screens. Efforts to charge the fire hoses for use in washing the screens were initiated at this time.

At approximately 1812 hours, multiple Unit 2 CWIP traveling screen high differential pressure alarms occurred. Spraying of the Unit 1 and Unit 2 CWIP traveling screens was initiated at approximately 1813 hours.

As a result of traveling screen high differential pressure conditions the 2C CWIP tripped at 1840 hours and approximately one minute later, the 2B and 2D CWIPs tripped. At 1841 hours, efforts to reduce Unit 2 reactor power commenced. In addition, the 2A CWIP (i.e., the standby pump) was started; however, prior to completion of pump start operation, condenser vacuum [SG] decreased below the main turbine trip setpoint due to the loss of the operating CWIPs. Consequently, at 1842 hours, with Unit 2 reactor power at approximately 90%, the main turbine tripped resulting in actuation of the Reactor Protection system (RPS)/[JC] trip logic and subsequent automatic reactor shutdown. The control rods inserted as required.

Reactor vessel water level decreased below the low level 1 setpoint (i.e., 166 inches of water above the top of active fuel (TAF)) resulting in Primary Containment Isolation system (PCIS)/[JM] Group 2 (i.e., drywell floor and equipment drains), Group 6 (i.e., containment atmospheric control

valves), and Group 8 (i.e., Residual Heat Removal system [BO] shutdown cooling valves) isolation signal actuations. This level shrink is expected following a reactor trip from power operation and the affected systems functioned as designed.

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At 1843 hours, Unit 1 reactor power reduction to 70% was commenced.

Although the Unit 1 1B and 1D CWIP traveling screen high differential alarms occurred and the 1D CWIP tripped due to high differential pressure conditions during this event, Unit 1 condenser vacuum did not decrease below the main turbine trip setpoint.

Following the Unit 2 reactor shutdown, the Electro Hydraulic Control system and the main turbine bypass valves were used to control reactor pressure.

Feedwater through the startup level control valve was used to restore reactor water level to the normal operating level band. By 1944 hours, the PCIS and RPS logic actuation signals had been reset. At 2140 hours, a notification to the NRC (i.e., Event Notification #35878) was made in accordance with the requirements of 10 CFR 50.72(b)(2)(ii), in that a condition resulting in the automatic actuation of Engineered Safety Feature systems including the RPS had occurred. The Event Notification indicated that the low condenser vacuum condition resulted from a fish run in the intake canal.

As part of readiness for restart of the Unit 2 reactor, inspections of the circulating water intake structure and associated traveling screens were

performed to ensure that further potential for clogging of the CWIP traveling screens did not exist and that the screens were functioning properly. On June 29, 1999, at 1517 hours, following review of the event by the Plant Nuclear Safety Committee, Unit 2 reactor startup commenced. On June 30, 1999, at 1424 hours, the Unit 2 main turbine generator was synchronized to the off-site electrical grid system.

The Unit 2 loss of condenser vacuum event is being reported in accordance with the requirements of 10 CFR 50.73(a)(2)(iv), in that, the event resulted in the automatic actuation of Engineered Safety Feature systems including the RPS.

#### EVENT CAUSE

Initial reports at the time of the event indicated that a fish run caused the clogging of the Unit 2 CWIP traveling screens; however, further evaluation has determined that the most likely cause of the event was silt fouling of the CWIP traveling fine mesh screens, exacerbated by an astronomically low tide. Although at the time of the event small fish were observed at the circulating water intake structure and on the CWIP traveling screens, further review has determined that the quantity of fish located in that area during this event was not large enough to have caused clogging of the CWIP traveling screens.

Operators involved with washing the traveling screens during the event observed significant accumulation of silt on the screens. The screen fouling resulted in a high differential pressure trip of the affected

CWIPs. The loss of the CWIPs resulted in decreasing condenser vacuum and the subsequent main turbine trip and automatic actuation of the RPS.

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Based on the most recent soundings for intake canal depth, the silt layer in the area directly in front of the Unit 2 circulating water intake structure is approximately four feet higher than the silt layer in front of the Unit 1 circulating water intake structure. The turbulence created from the 2C CWIP trip caused the silt at the bottom of the canal to mix with the canal water located at the intake to the CWIPs. The silt became entrained in the flow stream of the remaining operating CWIPs, and clogged the fine mesh traveling screens associated with the operating CWIPs.

#### CORRECTIVE ACTIONS

In accordance with the allowance provided by the State of North Carolina Department of Environment, Health, and Natural Resources Division of Water Quality National Pollutant Discharge Elimination System Permit for the Brunswick Steam Electric Plant, the traveling screen configuration has been altered temporarily to prevent unplanned decreases in power or plant trips during periods of increased vulnerability to CWIP traveling screen fouling. Currently, the fine mesh screens have been removed from every other screen panel installed on the traveling screens associated with three of the four Unit 2 CWIPs and two of the four Unit 1 CWIPs. Coarse mesh screen panels are installed on the traveling screens associated with the fourth Unit 2 CWIP and one of the remaining Unit 1 CWIPs. The remaining Unit 1 CWIP is

currently inoperable. Based on the current dredging schedule, the altered screen configuration will be maintained until approximately mid-August of 1999, when dredging in the area of the circulating water intake structure is scheduled to be completed.

Due to previously identified concerns with potential CWIP trips due to fouling of the CWIP traveling screens, Carolina Power & Light Company had developed a continuous dredging maintenance plan for the intake canal prior to this event. Dredging in accordance with this plan is currently in progress. Based on this recent event the dredging schedule/plan and intake canal depth profile will be re-evaluated and the necessary changes implemented to optimize this plan in support of preventing a similar occurrence.

A multi-disciplinary task force will be established to review operational guidance and develop an operational strategy to mitigate CWIP trips.

The period of vulnerability for circulating water intake traveling screen fouling due to potential contributing factors (i.e., fish, silt, grass) during low tide conditions will be evaluated and corrective actions identified to minimize recurrence of similar events.

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#### SAFETY ASSESSMENT

The safety significance of this event is minimal in that the affected systems responded as designed. In addition, the ECCS remained operable throughout the event. A total loss of condenser vacuum did not occur

(i.e., vacuum decreased to 24.01 inches of mercury) and consequently, the normal decay heat removal path was maintained through the condenser during the event.

#### PREVIOUS SIMILAR EVENTS

An event involving a loss of condenser vacuum resulting in a manual reactor shutdown was reported in LER 1-95-011. This event involved impingement of gracilaria on the fine mesh screens installed on the operating CWIP traveling screens. The gracilaria accumulation resulted from the combination of exaggerated high and low tides and stormy weather conditions that occurred prior to the event. The actions implemented to address this event focused on prevention of gracilaria and could not reasonably be expected to have prevented the most recent event.

#### COMMITMENTS

The dredging schedule/plan and intake canal depth profile will be re-evaluated and the necessary changes implemented by November 1, 1999, to optimize this plan in support of preventing a similar occurrence.

A multi-disciplinary task force will be established to review operational guidance and develop an operational strategy to mitigate CWIP trips. Task force actions will be completed by November 1, 1999.

The period of vulnerability for circulating water intake traveling screen fouling due to potential contributing factors (i.e., fish, silt, grass) during low tide conditions will be evaluated and corrective actions identified by September 10, 1999, to minimize recurrence of similar events.



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CP&L

Carolina Power & Light Company

P.O. Box 10429

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JUL 27 1999 10 CFR 50.73

SERIAL NO: BSEP 99-0125

U. S. Nuclear Regulatory Commission

ATTN: Document Control Desk

Washington, DC 20555

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NO. 2

DOCKET NO. 50-324/LICENSE NO. DPR-62

LICENSEE EVENT REPORT 2-1999-006-00

Gentlemen:

In accordance with the Code of Federal Regulations, Title 10, Part 50.73,

Carolina Power & Light Company submits the enclosed Licensee Event Report.

This report fulfills the requirement for a written report within thirty  
(30) days of a reportable occurrence.

Please refer any questions regarding this submittal to Mr. Keith R. Jury,

Manager - Regulatory Affairs, at (910) 457-2783.

Sincerely,

Jeffrey J Lyash

Plant General Manager

Brunswick Steam Electric Plant

SFT

Enclosure: Licensee Event Report

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Document Control Desk

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cc:

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